MINOUW

Case study results

1.3: Iberian hake stocks

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RESEARCH & INNOVATION

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Summary

Applying a SASOM (Stochastic Age-Structured Optimization Model) framework to:

- Estimate the economic impact of the LO on the small-scale fisheries in Galicia
- Compare the effects of two policies for mitigating unwanted catches in the Southern Iberian Hake: age selectivity improvements vs banning the sale for different age ranges

Case study results

Type of intervention

To apply the new developments of the SASOM (Stochastic Age-Structured Optimization Model) framework to quantify the economic and biological impact of the EU LO in small-scale fisheries in Galicia

Main activities carried out

The bioeconomic model that we use is based on the multi-species setting developed in Da Rocha et al. (2012). Figure 1 represents the logic of the model. It comprises two main model-boxes. One of them represents the biological aspects of the fishery. This model-box has inputs such as recruitments and parameters representing selectivity, weights, maturity levels, and natural mortality levels. The other box represents the economic model, which usually means the managers decision problem based on economic elements such as the cost and demand functions and the discount rate when the decision is a long-term one. Other social restrictions such as the preservation of jobs in fleets can also be considered by the economic model. The manager's decision problem is solved taking into account the biological model and as result optimal reference points for reference points (fishing mortality levels) are obtained. This optimal decision enables the stock to be evaluated in terms of economic indicators such as the net present value of the yield.

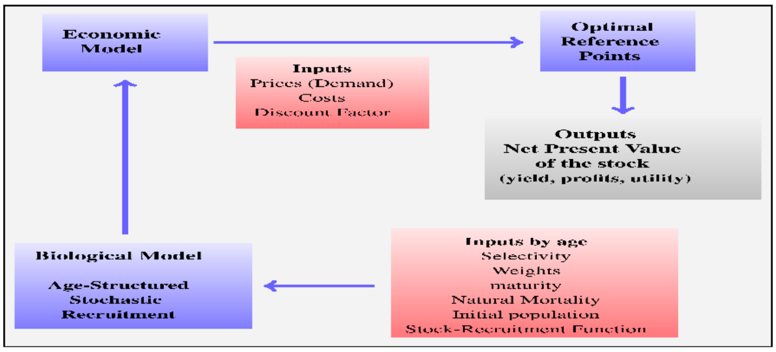

Figure 1: Optimal Reference Points with SASOM framework

Two analysis were developed with the SASOM framework:

1) Estimating the economic impact of the LO on the small-scale fisheries in Galicia
2) Comparing the effects of two policies for mitigating unwanted catches in the Southern Iberian Hake: age selectivity improvements vs banning the sale for different age ranges

- Da Rocha, J. M., Gutiérrez, M. J., and Cerviño, S. (2012). Reference points based on dynamic optimization: a versatile algorithm for mixed-fishery management with bioeconomic age-structured models. ICES Journal of Marine Science, 69(4), 660-69.

Main results

- Small-scale Galician fleet : The introduction of the LO policy in 2016 would implied:
    - Short and long-term losses in fishing days and yields for the small-scale hake fishery.
    - Future catches reduction. The future yield under the LO would be only 50% of the catches expected without it, regardless of the total volume of quotas allocated to the fleet

- Southern Iberian Hake Stock (ICES subareas VIIIc and IXa):
    - Measures that improve selectivity obtain better results than sales ban strategies in terms of increasing yields and stocks and reducing discards.
    - Reducing the selectivity parameters by 90% for the three early ages leads to an almost six-fold increase in the hake yield and lowers the discard rate by more than 20 percentage points
    - Banning the sale of the two youngest ages also increases hake yield by 21% and the discard rate by 7 percentage points

Discussion of the results

The scenarios analyzed for the age selectivity improvements should be understood as hypothetical because it will not be possible to implement them with the available fishing technology. The experiments assume that selectivity improves only for a particular range of ages but not for the remaining ages, and the improvement of age selectivity is the same, in percentage terms, for all the species caught in this mixed fishery. Even thinking in the future, it is difficult to believe that technological advances may lead to these "ideal" situations. Nevertheless, we think that these scenarios may be of interest because they demonstrate how fishery trends change as age selectivity improves.

Our study also shows that only when age selectivity changes significantly the results are positive in terms of increased yield and reduced discards. This finding is consistent with studies that show that large increases in the minimum mesh size are necessary to achieve significant impacts on biological and/ or economic variables (Prellezo et al., 2017). This result may lead to the discouraging conclusion that unless new fishing devices are really selective in targeting sizes of species caught, it is better not to adopt them. Therefore, testing the effectiveness of new fishing practices and gear devices is an essential step towards adopting new solutions to improve selectivity (Kennelly and Broadhurst, 2002).

The modelling approach used for the simulations in the present article is generic and can be applied to any fishery under any selectivity scenario. This means that once new fishing practices or devices have been developed, new age selectivity parameters will be available for simulating specific scenarios. Our study can therefore be seen as an additional contribution to the studies that have investigated the costs and benefits of age-selective fishing technologies [see Suuronen and Sardà (2007) for a compendium].

Another shortcoming of our analysis is that it does not take into account the cost of modifying and adapting the fishing technology for improving age selectivity. This is a common feature of the few studies that analyse the cost-benefit of a selectivity change (Macher et al. 2008). Certainly, selectivity can be improved without much cost by simply making new spatiotemporal decisions (Dunn et al. 2011). However, most experts consider that it is difficult to improve selectivity without incurring high costs when doing so requires modifications and adaptations of the current fishing technology (Villasante et al. 2016). Nevertheless, the increase yield resulting in our analysis from improving age selectivity can be seen as an approximation to the upper bound for the cost of incorporating the new technology into standard harvesting operations

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- Prellezo R., Carmona I., García D., et al. 2017. Bioeconomic assessment of a change in fishing gear selectivity: the case of a single-species fleet affected by the landing obligation. Sci. Mar. 81: 371-380
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CONCLUSION

Policies improving selectivity are better than sales ban strategies to reduce discards.

The MINOUW Consortium

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